

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
27 June 2002 (27.06.2002)

PCT

(10) International Publication Number  
**WO 02/49698 A1**

(51) International Patent Classification<sup>7</sup>: **A61M 15/00**,  
11/08, B05B 11/00, B65D 47/34

(21) International Application Number: PCT/SE01/02817

(22) International Filing Date:  
18 December 2001 (18.12.2001)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
0004751-4 19 December 2000 (19.12.2000) SE

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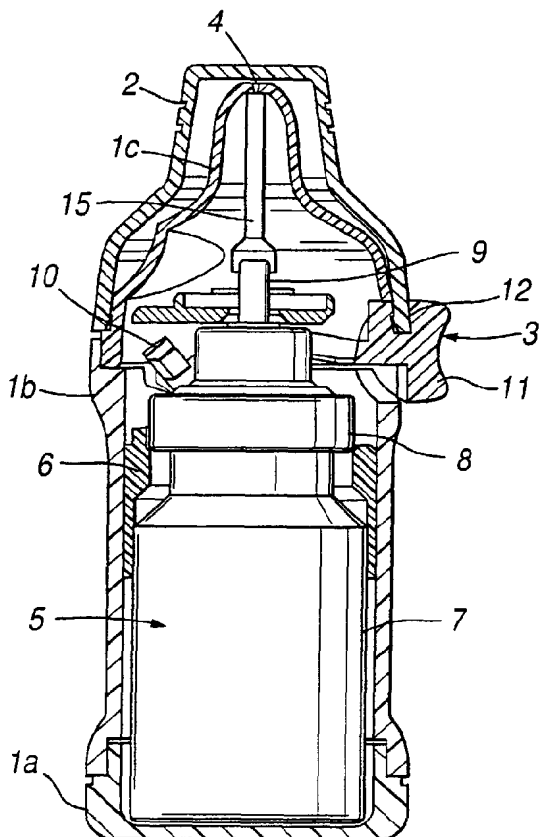
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(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG,

[Continued on next page]

(54) Title: A DELIVERY DEVICE



(57) Abstract: The present invention relates to a manually actuated delivery device for the delivery of a volume of liquid. The delivery device comprises a housing (1a, 1b, 1c) which includes an outlet (4) through which liquid, in use, is delivered, a removable cover member which at least partly covers the outlet (4), an actuating member (3) and a liquid delivery assembly (5, 6).



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SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

**(84) Designated States (regional):** ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Declarations under Rule 4.17:**

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AF, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,*

*KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW; ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)*

— *of inventorship (Rule 4.17(iv)) for US only*

**Published:**

— *with international search report*

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## A DELIVERY DEVICE

The present invention relates to a manually actuated delivery device for the delivery of a volume of liquid, in particular, a liquid containing medicament.

WO-92/20455 discloses one example of such a delivery device which takes the form of a nasal inhaler for the delivery of a volume of liquid containing medicament as a spray into a nasal cavity. This delivery device includes a nosepiece in the form of an elongate tubular section for insertion into a nasal cavity. The distal end nosepiece delivers the spray and is configured to be manually actuated by the application of a force axially relative to the longitudinal axis of the nosepiece.

Whilst such a delivery device is capable of delivering a metered volume of liquid, the use of the delivery device for delivery of a nasal spray can prove troublesome since the axial application of force tends to cause axial movement of the nosepiece within the nasal cavity which can lead to inefficient delivery of the liquid.

The present invention aims to overcome the problem of axial movement of the nosepiece by providing a delivery device configured such that the force for manual actuation is applied substantially orthogonally to the axis of delivery of the liquid. With such a configuration, inadvertent withdrawal or movement of the nosepiece can be obviated.

According to the present invention there is provided a manually actuatable delivery device for the delivery of a volume of liquid comprising a housing which includes an outlet through which liquid, in use, is delivered, an actuating member and a liquid delivery assembly, characterised in that the actuating member comprises a plurality of hinged elements forming a lifting frame which acts on the liquid delivery assembly.

Preferably, the hinged elements lift the liquid delivery assembly in a snap-action movement.

Preferably, a removable cover member which at least partly covers the outlet wherein the cover member and actuating member cooperate when the cover member is in position covering the outlet to prevent the actuating member from initiating liquid delivery until the cover member is removed.

Preferably, the liquid delivery assembly comprises a liquid delivery unit and a carrier unit for the liquid delivery unit, which are slidable as a single unit within the housing.

Preferably, the hinged elements form at least one pivot point which bears against the carrier unit to lift it upwardly when force is applied to the actuating member by a user.

Preferably, the liquid delivery unit comprises a container for liquid and a pump with a tubular nozzle, the tubular nozzle being slidable into the container to deliver a volume of liquid as a result of cooperation with a tubular feed within the housing when the carrier unit is lifted upwardly, the tubular feed leading to the outlet from the housing.

A preferred embodiment of the present invention will now be described in detail, by way of example only, with reference to the accompanying drawings, of which:

Figure 1 is a perspective view of the delivery device with the cover member in position;

Figure 2 is a section through the delivery device in Figure 1 in direction A-A;

Figure 3 is a perspective view of the internal features of the delivery device in Figure 1 with the device rotated anticlockwise by 90°;

Figure 4 is an exploded view in perspective of all the features of the delivery device;

Figure 5 is a view from the right hand side of the delivery device in Figure 1;

Figure 6 is a sectional view in direction X-X of the delivery device in Figure 5;

Figure 7 is a view in direction B of the delivery device in Figure 1; and,

Figure 8 is a sectional view in direction Y-Y of the delivery device in Figure 7.

Figure 9 is a partial sectional view in direction X-X in Figure 5 with the carrier unit, delivery unit and actuating member non-sectioned;

Figure 10 corresponds to Figure 9 depicting the delivery device in the actuating position.

The delivery device in Figure 1 comprises a housing 1, which includes a base portion 1a, a body portion 1b and a nozzle portion 1c, a cover member 2 and an actuating member 3. The cover member 2 is removed simply by a gripping and pulling movement.

In Figure 2, the internal elements of the delivery device are shown. The cover member 2 is in position over the nozzle portion 1c of the housing 1. The nozzle portion 1c has an outlet 4 through which liquid is delivered. The delivery device also includes a liquid delivery assembly which comprises a liquid delivery unit 5 and a carrier unit 6.

The liquid delivery unit 5 is a typical liquid delivery pump comprising a container 7 for liquid and a pump 8 with a tubular nozzle 9. The tubular nozzle 9 is slidable into the container 7 against the action of an internal return spring (not shown) to deliver a volume of liquid.

The base portion 1a is a snap-fit into one end of the body portion 1b and the nozzle portion 1c is similarly a snap-fit into the other end of the body portion 1b. The housing parts can also be secured by a plastics weld achieved, for example, by ultrasonic welding.

Figure 3 depicts the internal elements of the delivery device, in particular, the liquid delivery assembly 5,6 and the actuating member 3. In this Figure the construction of the actuating member 3 is clearly visible as a plurality of hinged elements 10, 16, 17 connected to an actuating button 11.

Figure 4 is an exploded view of all the elements of the delivery device, whereas Figures 5 to 8 depict various views and sections through the delivery device with the cover member 2 in position. The cover member 2 cooperates with the actuating member 3 when in position over the outlet 4. This is clear from Figure 6 where the open end of the cover member 2 sits in a slot 12 in the actuating button 11. In this way, the delivery device will not inadvertently actuate, for example, if dropped, unless the cover member 2 is removed.

Figures 9 and 10 depict the delivery device when the cover member 2 has been removed.

In use, the actuating button 11 is pressed by the user in the direction A which is substantially orthogonal to the axis of liquid delivery. When pressed, the actuating button 11 moves inwardly and the hinged elements 10, 16, 17 pivot at the pivot points 13, 14 on each side of the actuating button 11. The pivot points 14 sit in sockets 18 on either side of the body portion 1b (see Figure 4). The pivot points 13 bear against the carrier unit 6 which will rise in direction B and fall as the actuating button 11 is pressed and then released after actuation. Since the carrier unit 6 and liquid delivery unit 5 slide together, the actuating button 11 will cause the liquid delivery unit 5 to rise. In the actuating position (see Figure 10) the tubular nozzle 9 cooperates with the tubular feed 15 which is located in the nozzle portion 1c.

The tubular feed 15 leads to the outlet 4. Therefore, when the tubular nozzle 9 is pushed into the container 7 as the upward movement of the carrier unit 6 progresses, a volume of liquid will be delivered.

Because of the geometry of the hinged elements 10, 16 and 17 the actuating button 11 initially meets with a high resistance when the angle  $\theta$  of link 16 (see Figures 3 and 9) is smaller. As the actuation progresses, the resistance decreases as angle  $\theta$  of link 16 increases (see Figure 10). At this point, the force on the tubular nozzle 9 is relatively much greater than the force applied by the user to the actuating button 11. The effect of this is that the user feels a decreasing resistance to further pressing and the actuating button "snaps" into the actuating position. The snap-action has the advantage that there is a reduced likelihood of a partial dose being delivered.

**CLAIMS:**

1. A manually actuatable delivery device for the delivery of a volume of liquid comprising a housing which includes an outlet through which liquid, in use, is delivered, an actuating member and a liquid delivery assembly, characterised in that the actuating member comprises a plurality of hinged elements forming a lifting frame which acts on the liquid delivery assembly.
2. A device as claimed in Claim 1, wherein the hinged elements lift the liquid delivery assembly in a snap-action movement.
3. A device as claimed in Claim 1 or Claim 2, wherein the device also comprises a removable cover member which at least partly covers the outlet wherein the cover member and actuating member cooperate when the cover member is in position covering the outlet to prevent the actuating member from initiating liquid delivery until the cover member is removed.
4. A device as claimed in any preceding claim, wherein the liquid delivery assembly comprises a liquid delivery unit and a carrier unit for the liquid delivery unit, which are slidable as a single unit within the housing.
5. A device as claimed in Claim 4, wherein the hinged elements form at least one pivot point which bears against the carrier unit to lift it upwardly when force is applied to the actuating member by a user.
6. A device as claimed in Claim 5, wherein the liquid delivery unit comprises a container for liquid and a pump with a tubular nozzle, the tubular nozzle being slidable into the container to deliver a volume of liquid as a result of



cooperation with a tubular feed within the housing when the carrier unit is lifted upwardly, the tubular feed leading to the outlet from the housing.

7. A manually actuated delivery device substantially as herein described with reference to the accompanying drawings.

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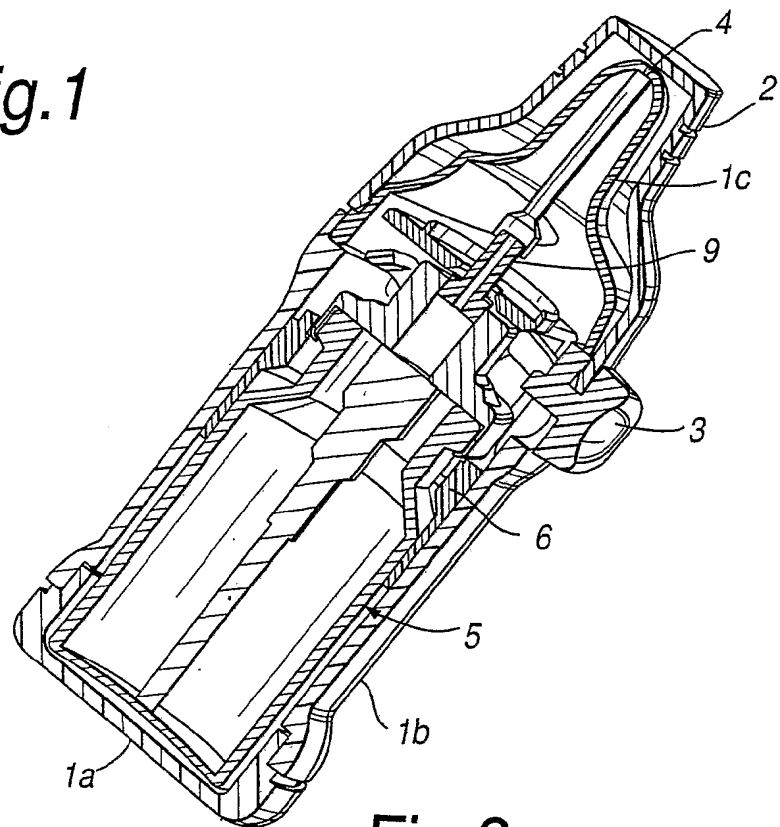
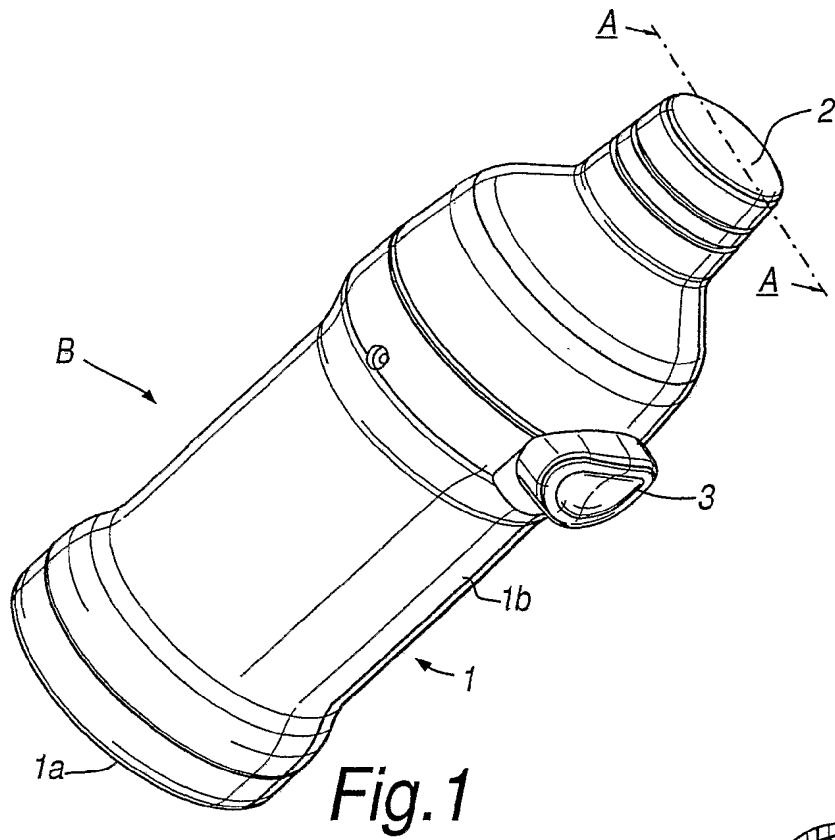


Fig.2

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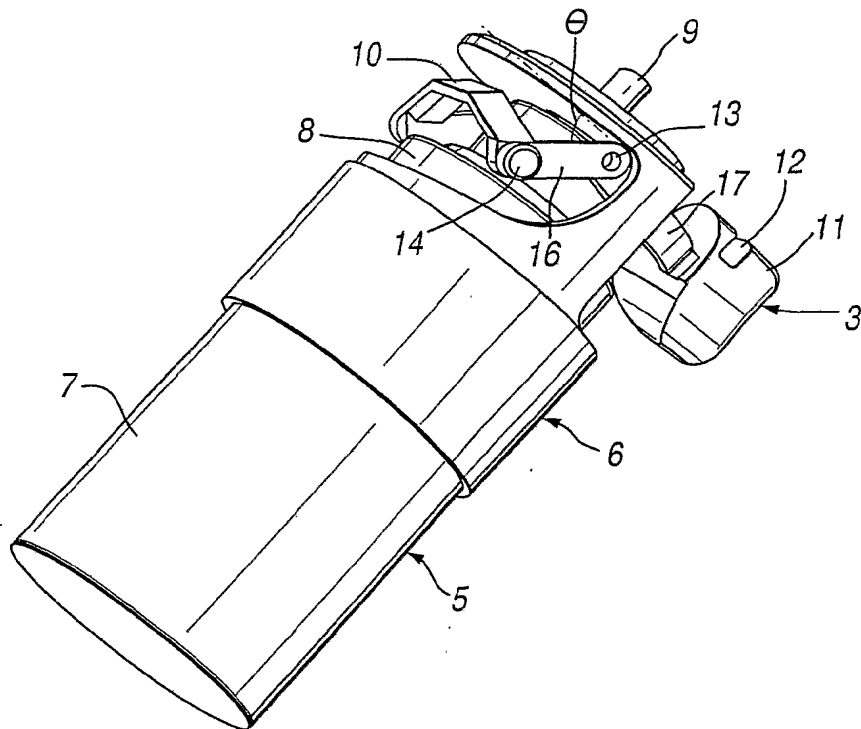


Fig.3

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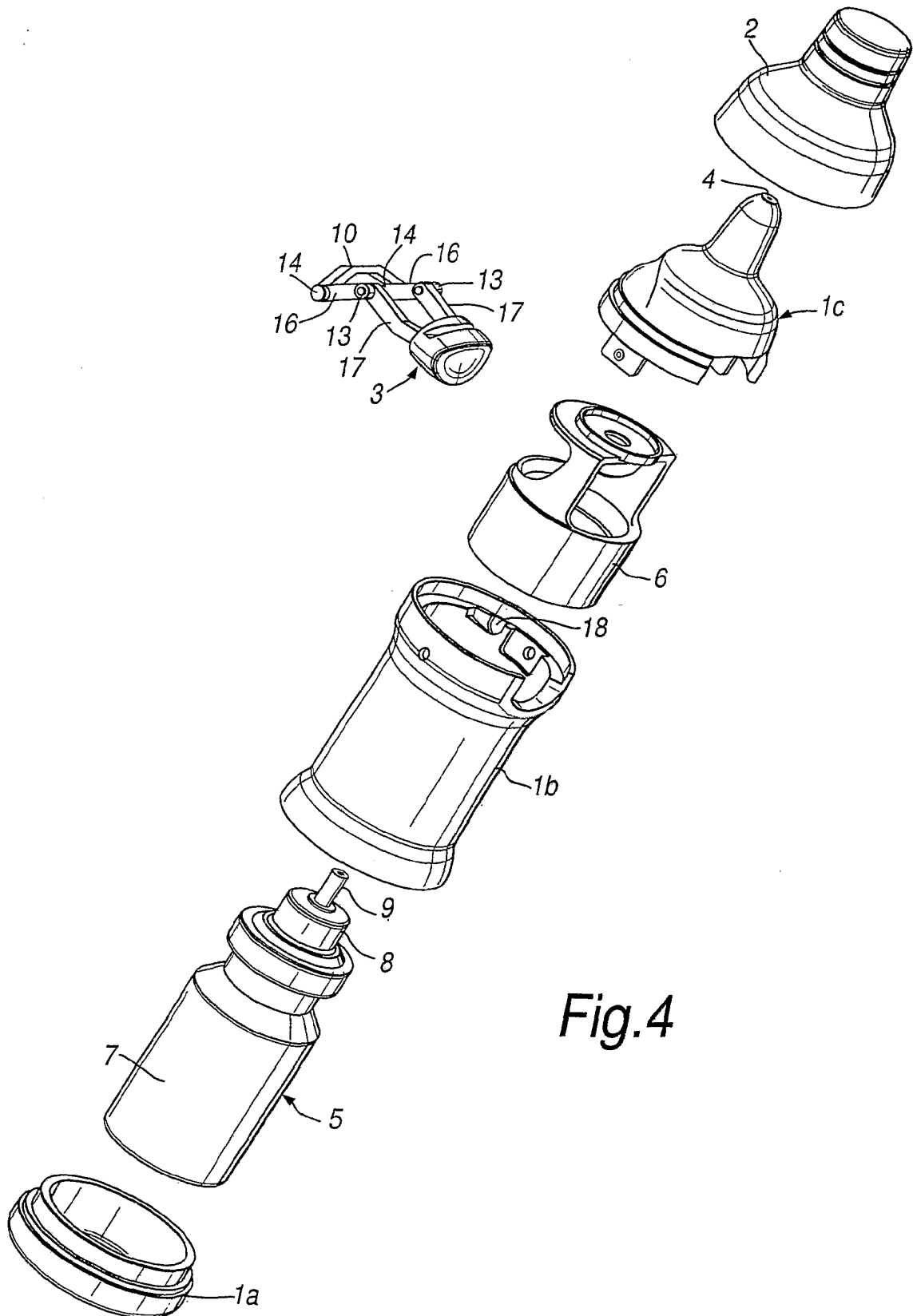
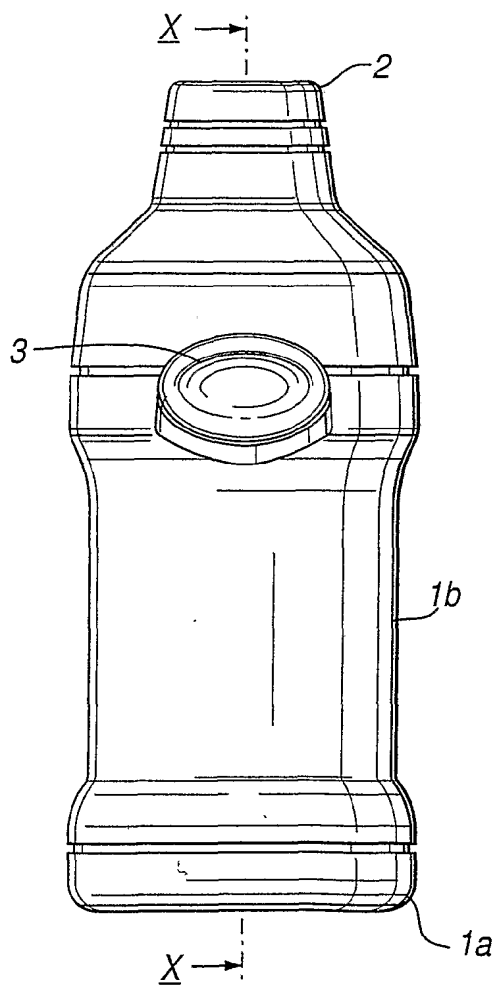
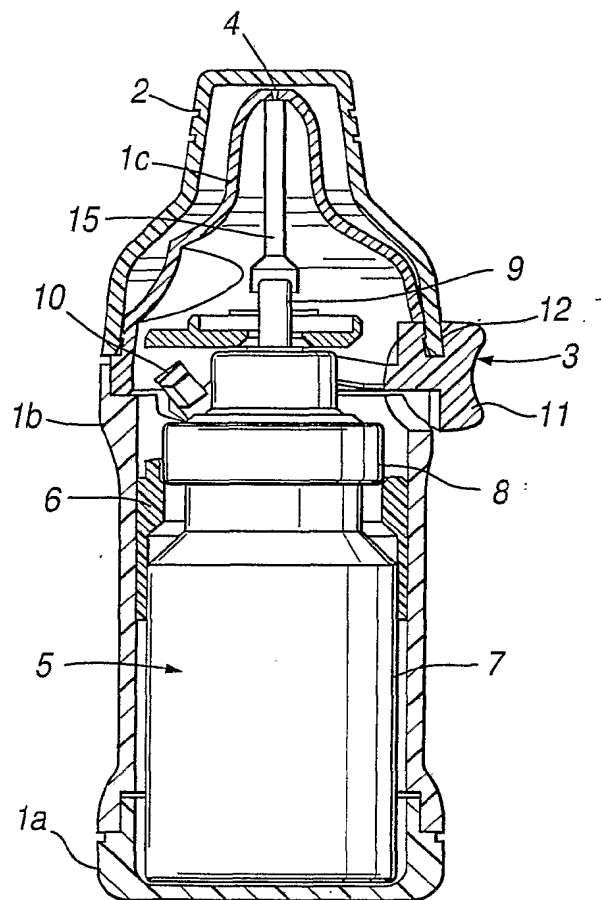
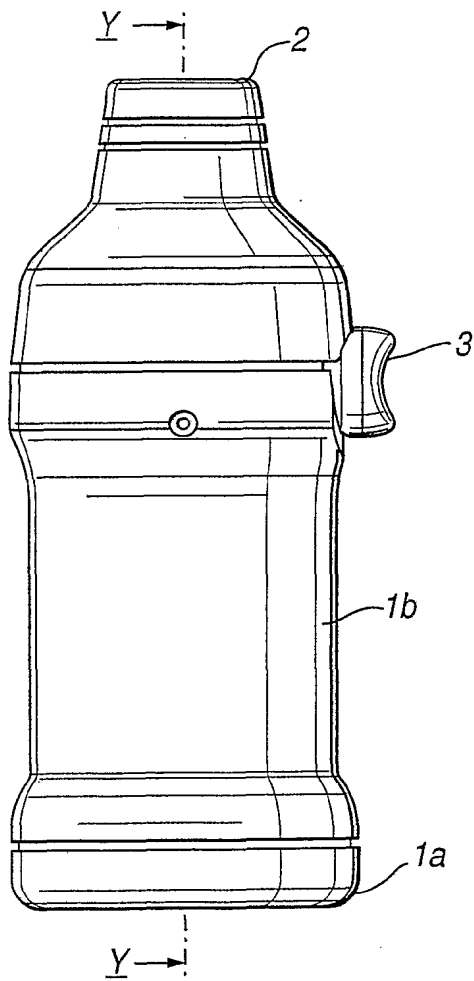
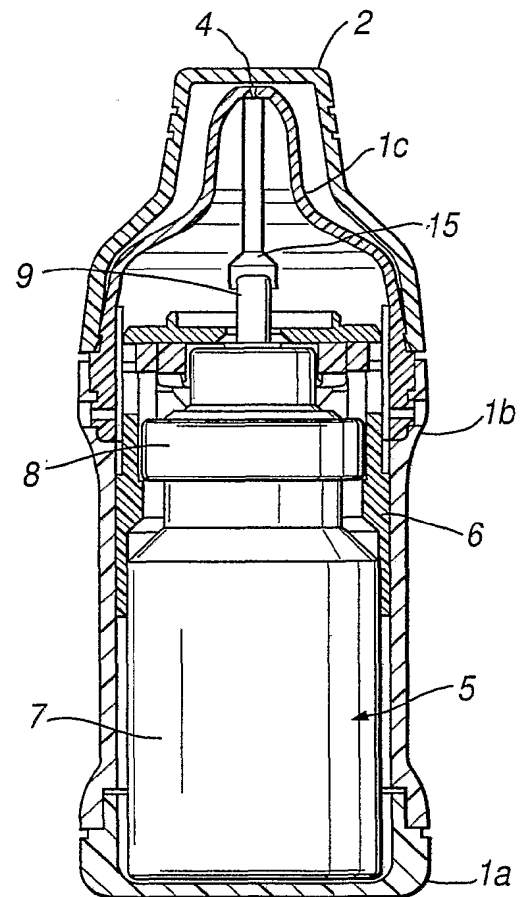


Fig.4

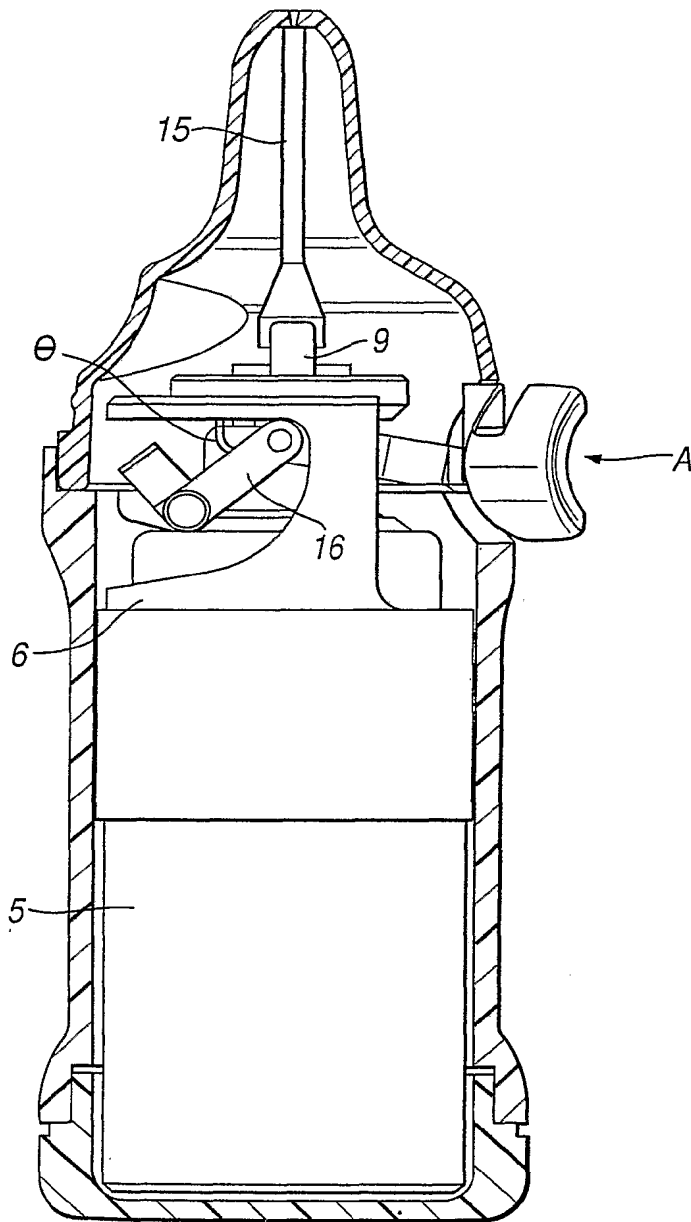
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*Fig. 5**Fig. 6*

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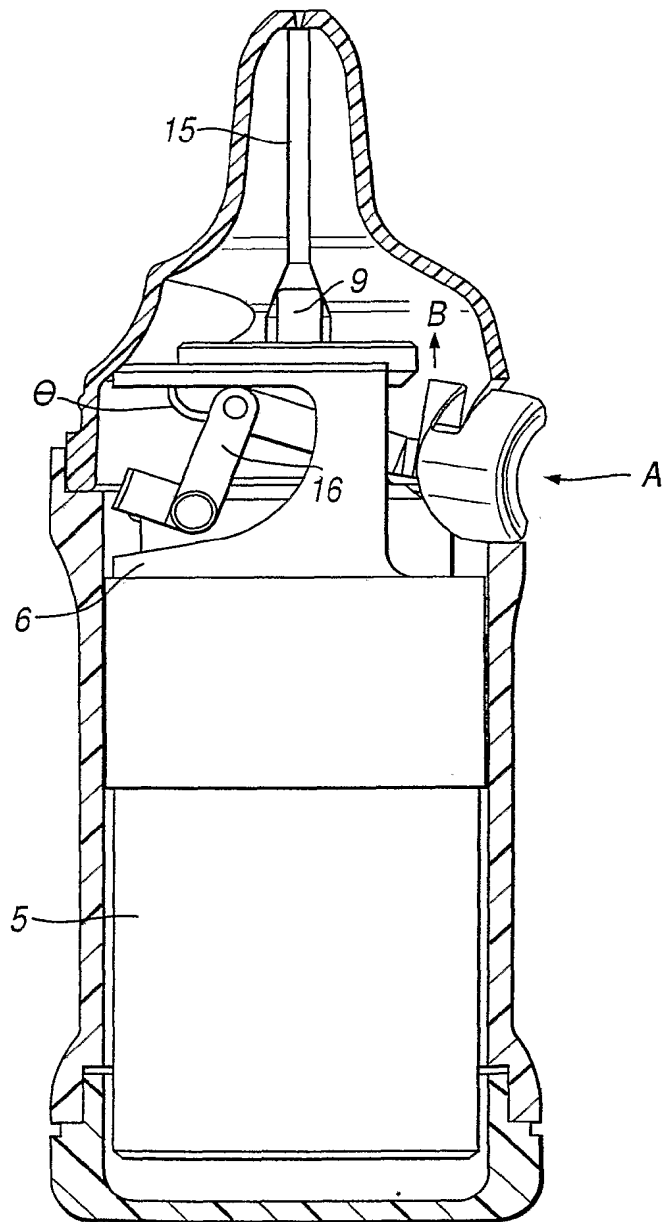
*Fig. 7**Fig. 8*

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*Fig.9*

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*Fig. 10*



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 01/02817

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A61M 15/00, A61M 11/08, B05B 11/00, B65D 47/34  
According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A61M, B05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 0103851 A (ASTRAZENECA AB), 18 January 2001 (18.01.01), abstract, fig. --	1-6
A	WO 9949916 A1 (ASTRA PHARMACEUTICALS LTD ET AL), 7 October 1999 (07.10.99), abstract, fig. --	1-6
A	US 4138039 A (MICALLEF), 6 February 1979 (06.02.79), abstract, fig. --	1-6
A	US 3966092 A (BALLU), 29 June 1976 (29.06.76), abstract, fig. --	1-6

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

Date of the actual completion of the international search

13 March 2002

Date of mailing of the international search report

20-03-2002

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 01/02817

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5615835 A (NELSON), 1 April 1997 (01.04.97), abstract, fig.  -----	1-6

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/SE01/02817

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.: 7  
because they relate to subject matter not required to be searched by this Authority, namely:  
**see next sheet**
2. ☐ Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.  
☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.  
PCT/SE01/02817

Claim shall not, except where absolutely necessary, rely, in respect of the technical features of the invention, on references to the description of drawings. In particular, they shall not rely on such references as: "as described in part.. of the description", or "as illustrated in figure..of the drawings."

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.  
PCT/SE 01/02817

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
WO	0103851	A	18/01/01	AU	6194400 A	30/01/01
				SE	9902672 D	00/00/00
<hr/>						
WO	9949916	A1	07/10/99	AU	3351899 A	18/10/99
				AU	8249698 A	25/01/99
				CN	1295487 T	16/05/01
				EP	0993751 A	19/04/00
				EP	1073491 A	07/02/01
				SE	9801078 D	00/00/00
<hr/>						
US	4138039	A	06/02/79	DE	2900094 A	17/07/80
				FR	2441742 A,B	13/06/80
<hr/>						
US	3966092	A	29/06/76	BR	7505970 A	03/08/76
				DE	2541213 A,C	25/03/76
				ES	441219 A	16/03/77
				FR	2285069 A,B	16/04/76
				HU	174393 B	28/12/79
				OA	5106 A	31/01/81
<hr/>						
US	5615835	A	01/04/97	US	5884845 A	23/03/99
				US	5509608 A,B	23/04/96
				AU	671303 B	22/08/96
				AU	4909193 A	05/05/94
				CA	2108647 A	22/04/94
				DE	69318256 D,T	26/11/98
				DE	69327735 D,T	08/06/00
				EP	0598237 A,B	25/05/94
				EP	0734783 A,B	02/10/96
				EP	0742050 A	13/11/96
				EP	0764471 A	26/03/97
				EP	0820815 A	28/01/98
				EP	0820816 A	28/01/98
				JP	6238204 A	30/08/94
				US	5385302 A	31/01/95
				US	5425482 A	20/06/95
				US	5507437 A	16/04/96
				US	5513800 A	07/05/96
				US	5551636 A	03/09/96
				US	5553752 A,C	10/09/96
				US	5566885 A	22/10/96
				US	5575407 A	19/11/96
				US	5593093 A	14/01/97
				AU	648226 B	14/04/94
				AU	8948091 A	26/05/92
				CA	2094712 A,C	26/04/92
				DE	69128722 D,T	06/08/98
				EP	0554373 A,B	11/08/93
				JP	2696147 B	14/01/98
				JP	6502345 T	17/03/94
				US	RE35744 E	17/03/98
				US	5234166 A	10/08/93
				WO	9207660 A	14/05/92
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